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ABSTRACT

A mixed modal study was conducted that compared the results of Mississippi Biology subject area mean scores of students that used 4X4 block, A/B block, and traditional year-long schedules in large, medium, and small-sized schools. This research also explored data about whether schedule configurations allow sufficient time for students to construct knowledge. Interviews were conducted with secondary administrators and teachers concerning the type of schedule configuration used and the influence that the schedule has on student academic performance on the Biology subject area test. The study used a quasi-comparative method for the quantitative portion of the study and a constant comparative method for the qualitative portion to explore the relationship of schedule configuration on student academic achievement on the Biology subject area test. The selected student scores indicated that the Mississippi Biology Subject Area test when used as a measure of student performance revealed no significant different on student achievement for the three school schedule configurations. Adjustment for initial differences of gender, minority status, and school size on each schedule configuration were made. Results suggest that schools may use various schedule configurations and still expect student performance on the Biology subject area test to be unaffected. However, many areas of concern were identified in the interviews that might have an impact on school learning environments. These relate to classroom management, the active involvement of students in learning, the adequacy of teacher education programs, and the stress of testing on everyone involved in high stakes testing. (Contains 31 references.) (SLD)

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Impacts of Scheduling Configurations

On Mississippi Biology Subject Area Testing

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By Dr. Fran Marchette

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IMPACTS OF SCHEDULING CONFIGURATIONS ON MISSISSIPPI BIOLOGY SUBJECT AREA TESTING

by Dr. Fran L. Marchette

Abstract

This study is important to educators because it can assist them in considering the impacts that different types of schedule configurations have on student performance and influencing testing results. A mixed modal study was conducted that compared the results of Mississippi Biology Subject Area mean scores of students that used a 4X4 block, A/B block, and traditional year-long schedule in large, medium and small sized schools. This research further explored data as to whether schedule configurations allow sufficient time for students to construct knowledge.

Interviews were conducted with secondary administrators and teachers concerning the type of schedule configuration used and the influence that the schedule has on student academic performance on the Biology Subject Area Test. This study used the causal-comparative method for the quantitative portion of the study and constant comparative method for the qualitative portion to explore the relationship of schedule configuration on student academic achievement on the Mississippi Biology Subject Area Test.

The selected student scores indicated that the Mississippi Biology Subject Area Test when used as a measure of student performance revealed no significant difference on student achievement for the three school schedule configurations. Adjustment in data for initial differences of gender, minority, and school size on each schedule configurations were made. Results imply that schools may employ various schedule configurations and expect student performance on the Mississippi Biology Subject Area Test to be unaffected. However, many areas of concern were identified in the interviews that might impact on school learning environments. These concerns relate to effective classroom management, the active involvement of students in learning, the adequacy of teacher education programs and the stress of testing on everyone involved in high-stakes testing.

DIMPACTS OF SCHEDULING CONFIGURATIONS ON MISSISSIPPI BIOLOGY SUBJECT AREA TESTING

by Dr. Fran L. Marchette

Many schools have transitioned from using yearlong class schedule to some form of block scheduling. This move of lengthening class time for a course has been a response to the research studies and the demand for better schools (National Commission on Excellence in Education (NCEE). 1984; National Education Commission on Time and Learning (NECTT). 1994. National Science Foundation (NSF). 1980). As a result of the study *A Nation at Risk* (NCEE, 1984) block scheduling has become the newest scheduling configuration used to provide better use of instructional time.

Researchers Canady and Rettig (1995) claim changing school schedules can result in school improvement and understanding the impact that scheduling has on students can help determine the best school schedule for teaching. It is estimated that over 50% of the high schools in the United States use some form of the block in scheduling a school day (Cawelti. 1994; Rettig. 1995). Approximately 90% of the high schools in Mississippi have changed to some form of the block schedule (MDE. 2001).

The 4X4-block schedule consists of four-90 minute class periods in the fall and four in the spring. The A/B block schedule the student takes four classes one day then another four on an alternate day for the entire school year. The traditional school schedule consist of 6-8 classes per day that meet 45-55 minutes per session.

When a new schedule is implemented it can affect several aspects of a school's operation such as the curriculum, class size, student conduct, teaching methods and ultimately, student achievement. The number of minutes a class meets during a class session is one variable that can positively influence student learning (NCEE. 1984). The 4 X 4 block schedule design provides for longer instructional time than the traditional six-period school day (Carroll. 1994). However, longer class periods (90-100 minutes) may also affect the attention span of students (Rettig & Canady. 1997).

A review of the literature suggests that students have a higher achievement rate on block schedules (Benton-Kupper, 1999; Deuel. 1999; Fuller & Johnson, 2001; Knight and DeLeon, 1999; Schoenstein, 1994). With block scheduling the number of students that a teacher sees daily is reduced (Canady. 1990) and teachers can delve more deeply into the curriculum (Benton-Kupper. 1999). Block scheduling also reduces the number of subjects

(disciplines) that students must attend daily and impacts the time students must have to process the course material to learn the subject matter. Canady (1995) and Carroll (1994) report that secondary science teachers found that they had more time for laboratory exercises and other "hands-on" activities. Studies by Lockwood (1995), and Wronkovick, Hess, and Robinson (1997) indicated that student academic achievement were either not affected or showed negative results when they used the block schedule. A study by Daves (1997) highlights student academic achievement in Mississippi was affected by school schedules and that school size played a part in the performance of students. Most of these studies use such measurement tools as the ACT when looking at student achievement.

A recent study in North Carolina by Lawrence and McPherson (2000) on end-of-year-testing for Biology I, US History, Algebra I, and English I, finds that there was a statistical difference in achievement in students using the traditional yearlong schedule and 4X4 block scheduling. In this study the Biology I test had a mean score of 39.00 and for traditional yearlong classes a mean score of 34.78 was reported.

In Mississippi as a result of accountability issues the Curriculum Content Assessment System (MCCAS) was developed. The MCCAS was the result of the 1982 Educational Reform Act and the Mississippi Senate Bill 2488 which established new accountability standards for students and schools (MDE, 2001). In Mississippi, the Subject Area Test is to replace the Functional Literacy Exam (FLE) as the graduation requirement. Mississippi Curriculum Content Assessment System was designed to: " (a) compare the performance of Mississippi school districts and schools to national normative data, (b) evaluate the performance of Mississippi schools and districts in teaching the Mississippi Curriculum Framework, (c) improve instructional practices in schools and districts, (d) provide an important part of the accountability system for schools and districts, (e) evaluate the strengths, weaknesses and proficiency levels of individual students, and (f) measure benchmarks for student performance" (MDE, 2001). The Biology Subject Area Test is part of the Curriculum Content Assessment System used by Mississippi for assessing students, schools and districts. Criterion-referenced tests in MCCAS include secondary end-of-course assessments in Algebra I, Biology I, English II and US History. The Subject Area Testing Program (SATP) has been phased in over the last several years. Starting in the 2001 school year, the Biology Subject Area Test became a graduation requirement for students entering the ninth grade in Mississippi schools (MDE, 2001).

This type of state assessment testing is referred to as high stakes testing. High stakes testing has positive and negative results. The "positive results are more attention to state curriculum, greater standardization across schools, higher expectations for student performance, and more support for low-performing students and schools"

(McColskey & McNunn, 2000, p. 116). They further state, "the negative results are neglect of subjects, topics, and outcomes that are not tested, over use of the materials that mimic state testing" (p. 116). Madaus and Clarke (2001, p. 51) state in their 30-year study that high stakes high standards tests "do not have a marked positive effect on teaching.

We know that instructional time spent in a classroom can affect student performance, and understanding the impact that a change in the schedule has on student achievement is vital. Since many of our schools have converted to block scheduling and have implemented new assessment testing requirements for students that hinge on graduating, we need to determine if there is any relationship between student performance and the type of schedule they use. Since there are a limited number of studies on assessment testing that show the effects of block scheduling on the testing results. "Better testing or more testing will not improve the quality of teachers attracted to the profession; in fact, it will discourage many creative and caring people from working in K-12 education" (Paris & McEvoy, 2000). Understanding the impacts that different scheduling configurations have on students' academic performance can assist secondary science classroom teachers and administrators to provide the best possible environment for student success on these high stakes testing programs.

A study by Bateson and Parsons-Chatman (1989) found that girls perform lower on science standardized testing than males. Researchers Demars & Keeves (1998), Dimitrov (1999) and Harding (1981) report that the format of the test, such as multiple choice testing, can affect the performance of females on standardized test. However, Damnjanovic's (1998) and Hall & Davis (1999) studies report White students did score higher than Black students. Boyd (1977) and Linn (1991) report that standardized test under-predict or are not directly related to performance of female and Black students. Since these standardized test scores are generally used to determine a student's achievement level and future success rate, test results become very important.

The overall goal of this mixed modal study is to discover the impacts of different types of scheduling on student testing performance on the Biology Subject Area Test. This study is important to teachers and administrators because it can assist them in determining the effects those different types of class scheduling have on student performance. This guiding question of this study: "Is there a significant difference between the dependent variable biology scores on the Subject Area Test and the independent variable of selected school schedules while controlling for school size, gender and race?" This study also examined the effect that school size has on student performance on the three different type schedules.

It is important to understand what teachers and administrators believe about how the schedule a school uses affects student performance on high stakes testing. The ability of a school district to provide a positive learning environment contributes to the success or failure of students. With the increasing pressures of high stakes testing being placed on teachers and students, it is imperative to understand what influence school schedule configurations have on students and teachers.

This study used both qualitative and quantitative methods to explore the relationship of school schedules on student academic achievement on the Biology Subject Area Testing in the state of Mississippi. A mixed model study was selected because statistical test score data alone does not help educators understand how students are affected. The quantitative portion compared the results of Biology Subjects Area mean scores of students on a 4X4 block schedule, A/B block schedule and traditional yearlong schedule for large, medium and small size schools. The qualitative portion examined, (a) what do administrators and teachers feel the type of schedule used has on student academic performance on the Biology Subject Area Test? (b) do administrators and teachers feel the schedule allows sufficient time for students to construct knowledge? And (c) do school size, race and gender influence the performance of students on the Biology Subject Area Test? This study used causal-comparative analysis method for the quantitative portion of the data and the constant comparative analysis method for the qualitative data.

Quantitative Aspect

The quantitative portion of this study was designed to investigate the effects that different types of class schedules have on student performance in regards to the Biology Subject Area Test while controlling for race, gender, and school size. School-wide student achievement in biology was determined by using the Biology Subject Area Test, which is norm referenced. The Hypothesis was: There will be no significant difference in mean scores of students taking Biology Subject Area Test on a 4X4 block schedule, A/B block schedule or a traditional yearlong schedule when controlling for school size, gender and minority enrollment. This limitations found in this study are: (a) the sample size used for determining significance of this study, (b) differences in instructional strategies used by teachers and schools, (c) timeframe of the study, (d) content of the test used by the state and (e) the use of aggregate data from the schools selected.

This participants for the quantitative portion study which was conducted in the fall of 2002 and included 75 high schools utilizing the traditional schedule, 47 high schools utilizing the 4 X 4 block schedule and 25 high schools utilizing the A/B block schedule for a total of 147. The high schools were stratified by size into three

categories (the large category consists of 5A schools, the medium category consists of 4A schools, and the small category consists of 1-3A schools) and schedule type. The classification of 1A-5A is based on the Mississippi High School Activities Association's (MHSAA) classification. Mean score data (2001-2002 school year) from the Biology Subject Area Tests and demographic data were obtained from the MDE.

The method used in this study to ensure validity and reliability of the quantitative data consisted of using the norm-referenced test results reported by MDE. Norm-referenced tests are designed to measure a broad spectrum of information allows for (a) students to be compared to one another, (b) school to school comparisons, and (c) state-to-state comparisons of student performance. Norm-referenced tests initially are developed through choosing a statistically representative broad cross-sectioned group of students (norm group) for the control group (MDE, 2001). The MDE employs the National Standardization Program to obtain normative data for determining student proficiency in biology. A minimum number correct of 33 or "statistically converted to a scale score (of 300) through a procedure that takes into account item difficulty and content" is needed to pass and then the "scale scores allow direct comparison of results from student to student and year to year" (MDE, 2001, p. 2).

Validity was assured by the fact that teachers and other educators were involved in all phases of the development of the criterion-referenced test. The developers used the Mississippi Curriculum Framework as a guide for designing the test. Reliability is supported by the state through the procedures they require of the schools to use (a) the state adopted curriculum for teaching biology, (b) the same procedures in administration of the Biology Subject Area Test, and (c) specific method to score and tabulate the test.

The Descriptive Statistical data in Table 1 were used to test this hypothesis. A one-way analysis of covariance (ANCOVA) was conducted. To determine significance, data collected were analyzed using the SPSS for Windows Version 10.0 program. An alpha level of 0.05 was used to test the hypothesis. The independent variable, school schedules configurations, included three types: traditional year-long schedules, A/B block schedule, and 4 X 4 block schedule. The dependent variable was the biology mean score from each of the 147 Mississippi high schools. The covariate was minority, gender, and school size. The aggregate score means of the biology subject area test of the 147 Mississippi high schools were controlled for by adjusting for the differences of gender, minority, and school size on the three different schedule configurations. The A/B block schedule had the highest aggregate mean (338.30), the 4 X 4 block schedule had the second highest aggregate mean score (334.27), and lowest aggregate

mean was the traditional schedule (326.26). The ANCOVA was not significant, $F(2, 140) = 1.807$, $p = 0.168$. There were no significant differences in the mean scores between school schedule configurations.

Table 1 *Descriptive Statistics*

	Mean	Std. Deviation	N
Schedule Type			
Traditional	326.26	16.44	75
4 X 4 Block	334.27	17.17	46
A/B Block	338.30	59.11	25
Overall Total	330.84	28.84	146

The finding that the biology test scores do not statistically show any difference regardless of the school schedule configurations is of educational importance. This indicates that student performances on these end-of-course tests, such as biology, seem not to be subject to influence from the school schedule. Additionally, school size, gender, and minority issues do not influence to any significant level a difference in test scores on any school schedule configuration. Based on the findings from this study, Mississippi schools might use the 4 x 4 block schedule, A/B block schedule, or the traditional year-long school schedule configurations without fear of adverse impacts from scheduling on students' end-of-course-test performance.

Qualitative Aspects

The eighteen participants (one biology teacher and one administrator from nine schools (three large-sized high schools, three medium-sized high schools, and three small-sized high schools) were selected. The participants came from nine randomly selected schools using the different school schedule types studied. Data from interviews with school administrators and teachers were gathered in the fall of 2002.

The method used to ensure triangulation of the qualitative data was the use of multiple data sources (interviews and field notes) to corroborate findings and eliminate bias (Cresswell, 1998) and the development of categories and emerging themes from data collected (Merriam, 1988). The method described by Cresswell (1998) for developing themes was used to analyze. Each 15 minute semi-structured interview used a basic protocol to initiate the interview; however, other questions emerged as the interview progressed and were added during the interview. The basic protocol was faxed to each participant prior to the actual interview. The interview was taped, with permission of the participant, and field notes were taken. Each interview and subsequent field notes were

transcribed, and a copy of each transcript was provided to the participants for review, clarification, and editing where necessary.

The nine biology teachers interviewed consisted of five males and four females whose background ranged from two years of teaching experience to 10 years of teaching experience. Four of the five teachers came into teaching the alternate route. The nine administrators interviewed consisted of five males and four females with varying degrees of educational experience ranging from 26 years to eight years in education and two years to 11 years of experience using their current schedule.

Teachers and administrators who worked in schools that used either the 4 X 4 block schedule or the A/B block schedule expressed a higher degree of satisfaction with the block schedule. A reason that these teachers and administrators preferred the block schedule over the traditional schedule is that they felt this schedule provided the best opportunity for classroom learning. This preference was based on several factors. These educators felt that the 4 x 4 block schedule and the A/B block schedule allow for extended time for labs and other classroom daily activities. The block schedule provided for more in-depth study time in the classroom. Additionally, they believe that student time on task improves with the block schedule.

Other advantages cited by the block teachers and administrators centered on school management issues. These reasons ranged from students having the ability to repeat failed classes and still graduate on time, improved student discipline, enhanced classroom management, to increased student attendance. These latter advantages are not directly correlated to increased student academic performance; however, these resulted in improved opportunity for school success as well as an improved study environment. Many administrators expressed concern about the results of the test since "the state has linked our accreditation level to the test results"

Block teachers and administrators clearly indicated that the block schedule places a higher demand on block teachers to be more effective in the classroom. They indicated a necessity for block classroom teachers to develop the skills and strategies that provide the best possible opportunity for students to succeed. They also indicated that the block schedule requires that teachers adjust their methods and strategies when they teach on the block schedule.

Administrators and teachers who used the traditional year-long schedule believed that the year-long schedule provides a better learning environment. It allows students to learn over a more extended length of time and it is believed that teachers can keep students' attention better for the entire time in class (55-minutes). Also, traditional

scheduling provides more opportunity to promote, encourage, and provide support for students who participate in projects such as science fair projects which has decreased in many 4 X 4 Block schedule schools)

Administrators and teachers had many of the same concerns. The factors that many of these educators cited as influencing student achievement were: (a) students' attention span, (b) students' level of commitment to subject matter (homework), (c) timing of the test administration, and (d) the best way to instruct students. Additional concerns raised by teachers and administrators regarding school scheduling focused on high stakes testing issues which are out of their direct control. Issues such as pressure on students to perform well on tests, pressure on teachers to have their students succeed, and the pressure placed on administrators and curriculum coordinators to ensure students' score well on the tests were expressed by most of the educators interviewed. School districts also feel this pressure since test results are linked to state accreditation levels for schools and to federal funding. Parents' and students must also understand the demand and commitment level needed for academic success.

Other factors that were of concern to these educators included the education teachers receive prior to entering the profession and support they receive for teacher training. They expressed concern that universities, colleges, and school districts need to assist teachers to develop effective teaching strategies that can be used in the classroom. Many of today's teachers were generally taught on the traditional schedule, therefore, they emulate the teachers they had. The Educational Testing Service (2000) indicates that content specific pedagogy, the methods portion of teacher training, should be enhanced because subject matter knowledge alone is not sufficient to be an effective teacher.

No issues related to minority or gender were discovered in this research. The population of students identified as showing any influence was students enrolled in special education, especially students with learning disabilities. Many educators interviewed felt that these students may eventually drop out of school if they repeatedly fail the test.

Conclusion

The teacher is a key variable in the success of a student in the classroom. A teacher must become confident enough to step out of the box and develop methods and materials that they design particularly for their students. That is the essence of teaching, to design instruction to meet perceived needs. The block schedule has put higher demands on teachers to be more effective in the classroom. The block schedule especially requires careful planning on the part of the teacher and the use of a greater variety of teaching strategies to ensure an active learning

environment. Many teachers, especially alternate route teachers, and novice teachers lack the educational and experiential background to be effective classroom managers in any schedule configuration they may find themselves in. Most effective teachers either have developed the skills over time or have benefited from some form of training. Colleges and universities provide some professional foundation and methods classes for teachers pursuing teaching credentials. Many science teachers enter the profession by the alternate route. Five of the nine teachers interviewed in this study entered the teaching profession through the alternate route.

As society is constantly changing, teaching strategies should also change and continually improve. Studies by Zepeda (1999) and Zepeda and Myers (2000) indicate that teachers must modify their teaching strategies as well as provide good transitions to ensure the best learning environment for achievement. By implementing new teaching strategies and good transitions, teachers will be able to increase opportunities for improving students' academic achievement. What a teacher does in the classroom can influence the academic performance of students.

Improved teaching strategies on all schedule configurations need to be provided to secondary teachers through adequate in-service training mechanisms. Training must be implemented at the district level. Districts need to hold appropriate in-service training for their teachers particularly when implementing changes. Schools need to monitor their teachers more closely and work with teachers who are struggling with problems in the classroom, especially alternate route and novice teachers. All classroom teachers need to review their pedagogical approach. Additionally, at the college or university level teachers should explore educational opportunities themselves that can enhance their effectiveness in the classroom.

Many professors at institutions of higher education have little or no experience teaching on the block schedules in secondary school settings and they might benefit from engaging in field work in high school classrooms while collaborating with practicing teachers. Professors need to understand and experience what current classroom conditions are like for teachers in secondary schools. As times change, teaching strategies may also need to change and improve. Therefore, even when teaching in traditional scheduling configurations, more in-service training on varied teaching methods should be provided. University faculty must also help develop coursework and model necessary teaching skills to adequately prepare pre-service teachers.

State educators need to listen to teachers and administrators regarding the timing of the test. The state should administer the tests closer to the end of a course, especially for those students on the 4 X 4 block schedule. Additionally, educators can encourage and counsel students regarding good study habits and on coping with the

stress of testing. The reduction of test apprehension can lead to improved test scores and result in students who are less likely to drop out of school.

Through the improvement in study skills and reduced test apprehensions, the students' test performance should improve. Additionally, teachers and schools must communicate to families the level of commitment necessary for students to successfully achieve at school no matter what school schedule a school employs. When students and families understand the degree of commitment needed to succeed, their academic performance should improve.

The literature gives some insight into influences of different school schedules on schools and students. This research further supports the need to improve the educational system through studies that focus on school scheduling, teacher preparation, and classroom methodology. Since there are not sufficient data available to determine the influence that the Mississippi State Subject Area Test has on students, teachers, and school districts more research should be done.

As a result of this study, the following recommendations for future study or actions are made:

1. Repeat this study using raw scores from the Mississippi Subject Area Test and all school schedule configurations.
2. Develop other studies to be conducted on scheduling influences on student learning. Such studies should include developing the most effective ways for teachers to retain student attention span, determining if socioeconomic status has any influence on student learning with different schedule configuration, and determining if student age (maturity level) influences student learning on different school configurations.
2. Create improved teacher preparation programs and the professional development activities that should be offered by school districts. These activities should be designed help them to be effective teachers by focusing on topics that include the increased demand for teacher accountability, teaching strategies for use with 90-minute class periods, the teaching of study skills, reduction of stress on teachers and students as well as the effective use of class time to improve learning for all students.
3. More research should be conducted on the impact of high stakes testing (i.e., state end-of-course tests) such as the Mississippi State Subject Area Test. A determination of the impact it has on students, teachers, and school districts is necessary. The state should investigate the issue of the timing of these end-of-course tests for the block schedule classes.

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